

WHAT IS CLAIMED IS:

- 1           1.    A distributed computer network, comprising:  
2                    a plurality of processors, and  
3                    at least one communication medium for  
4   interconnecting the plurality of processors:  
5                    wherein the plurality of processors are  
6                    logically arranged such that each processor can  
7                    operate at a top level of a hierarchy that includes  
8                    at least a significant number of the plurality of  
9                    processors by sending a message to at least one  
10                   logically neighboring processor;  
11                   wherein the message is disseminated  
12                   throughout the hierarchy by each processor that  
13                   receives the message forwarding the message to at  
14                   least one logically neighboring processor such that  
15                   each processor in the hierarchy receives the message  
16                   only once.
- 1           2.    The distributed computer network of claim 1,  
2                   wherein the at least one communication medium includes at  
3                   least one physical interconnection unrelated to the  
4                   logical arrangement of the plurality of processors.

1           3.    The distributed computer network of claim 1,  
2    wherein each processor that receives the message forwards  
3    the message to one or two logically neighboring  
4    processors.

1           4.    The distributed computer network of claim 1,  
2    wherein the plurality of processors include a processor  
3    situated at a logical center and the remaining processors  
4    are logically arranged around the logical center.

1           5.    The distributed computer network of claim 4,  
2    wherein the plurality of processors are logically arranged  
3    in a polygonal configuration having an even number of  
4    sides.

1           6.    The distributed computer network of claim 4,  
2    wherein the plurality of processors are logically arranged  
3    in a three dimensional configuration.

1           7.    The distributed computer network of claim 4,  
2    wherein each processor tends to move to a location closer  
3    to the logical center if said location is not occupied by  
4    another processor.

1           8.    The distributed computer network of claim 7,  
2    wherein each processor further tends to move in a  
3    predetermined direction to an adjacent location on the  
4    same logical level if said adjacent location is not  
5    occupied by another processor.

1           9.    The distributed computer network of claim 4,  
2    wherein each processor tends to switch positions with an  
3    adjacent processor closer to the logical center when the  
4    adjacent processor has less available bandwidth than said  
5    processor.

1           10.   The distributed computer network of claim 1,  
2    wherein the message relates to a broadcast of data.

1           11.   The distributed computer network of claim 1,  
2    wherein the message relates to a search for information  
3    selected from the group consisting of specified data and a  
4    specified processor.

1           12. A distributed computer network comprising:  
2                 a collection of computers logically arranged  
3     such that a first computer of the collection of computers  
4     is situated at a logical center of the collection of  
5     computers, wherein a plurality of computers from the  
6     collection of computers form a series of concentric  
7     polygons around the first computer; and  
8                 wherein each computer in the collection of  
9     computers can act as a top computer in a hierarchy of  
10    computers, said hierarchy including at least a subset of  
11    the collection of computers by:  
12                 said top computer sending a message along  
13         each of at least one radial, each of said at least  
14         one radial comprising a line of logically adjacent  
15         computers in the collection of computers that  
16         logically extends radially from said top computer;  
17         and  
18                 at least one lower level computer, of the  
19         collection of computers, located on one of said  
20         radials further forwarding the message along an  
21         indirect radial, each indirect radial comprising a  
22         line of logically adjacent computers in the  
23         collection of computers that logically extends

24           radially from said at least one lower level computer  
25           but does not logically intersect any of the at least  
26           one radial.

1           13. The distributed computer network of claim 12,  
2           wherein each computer not located on an outermost edge of  
3           the collection of computers has the same number of radials  
4           extending therefrom as there are sides of the concentric  
5           polygons.

1           14. The distributed computer network of claim 12,  
2           wherein each computer operates to:  
3                 move to a position closer to the logical center  
4           when said closer position is not occupied by another  
5           computer; and

6                 move, in one of a clockwise and a  
7           counterclockwise direction, to a position at the same  
8           level as a current position of the computer when the same  
9           level position is not occupied by another computer.

1           15. The distributed computer network of claim 14,  
2     wherein each computer further operates to prevent  
3     neighboring computers from moving during each of said  
4     moving to a closer location and moving to a same level  
5     position.

1           16. The distributed computer network of claim 12,  
2     wherein each respective computer in the collection of  
3     computers stores information relating to each of a  
4     plurality of subordinate computers logically connected to  
5     and located around the respective computer.

1           17. The distributed computer network of claim 16,  
2     wherein a top computer in the collection of computers can  
3     initiate a search for content on the plurality of  
4     subordinate computers that correspond to each computer in  
5     the collection of computers by sending said message.

1           18. The distributed computer network of claim 12,  
2     wherein said message is selected from the group consisting  
3     of broadcast data, a search parameter, and update  
4     information.

1           20. The distributed computer network of claim 19,  
2    wherein each of the computers in the collection of  
3    computers is forwarded the message only once.

1           21. A method for communicating in a computer  
2 network, comprising:  
3           logically arranging a plurality of computers  
4 around a first computer situated at a logical center of  
5 the plurality of computers;  
6           initiating a message at a top computer selected  
7 from the plurality of computers;  
8           sending the message from the top computer along  
9 at least one series of logically adjacent subordinate  
10 computers that logically extends radially from the top  
11 computer, the plurality of computers including said  
12 subordinate computers; and  
13           forwarding the message, from at least one of the  
14 subordinate computers that logically extend radially from  
15 the top computer, along at least one series of logically  
16 adjacent computers that logically extends radially from  
17 the at least one subordinate computer but that does not  
18 intersect any of the series of logically adjacent  
19 subordinate computers that logically extend radially from  
20 the top computer.



1           22. The method of claim 21, wherein the step of  
2     logically arranging comprises establishing a plurality of  
3     logically neighboring computers for each computer, wherein  
4     each computer has no more than a predetermined number of  
5     logically neighboring computers, and wherein the plurality  
6     of computers are evenly distributed around the first  
7     computer.

1           23. The method of claim 21, further comprising the  
2     step of switching positions of at least two adjacent  
3     computers to move computers with lower bandwidth  
4     availability away from the logical center of the plurality  
5     of computers.

1           24. The method of claim 21, further comprising the  
2     step of delaying sending of the message from the top  
3     computer if a bandwidth utilization of the plurality of  
4     computers is above a predetermined threshold.

1           25. A method for logically configuring a collection  
2 of computers, comprising:

3                 selecting a computer to serve as a logical  
4 center of the collection of computers;

5                 adding computers to the collection of computers  
6 to logically configure the computers into a plurality of  
7 concentric polygons, wherein each added computer operates  
8 to:

9                         find a computer in the collection of  
10 computers;

11                        follow one of a radial and an indirect  
12 radial that includes the found computer to a  
13 collection edge, said radial comprising a series of  
14 logically adjacent radial computers that logically  
15 extend from the logical center, and said indirect  
16 radial comprising a series of logically adjacent  
17 computers that logically extend from one of the  
18 radial computers, wherein the collection edge  
19 comprises a logically outermost computer on said one  
20 of the radial and the indirect radial; and

21                        logically attach to a computer the  
22 collection of computers on the collection edge.

1           26. The method of claim 25, further comprising the  
2   step of moving each added computer to a neighboring  
3   logical position that is logically closer to the logical  
4   center of the collection of computers if said closer  
5   neighboring logical position is not currently occupied by  
6   one of the computers in the collection of computers.

1           27. The method of claim 26, further comprising the  
2   step of rotating each added computer to a neighboring  
3   logical position on the same logical level as the added  
4   computer if the same level neighboring logical position is  
5   not currently occupied by one of the computers in the  
6   collection of computers.

1           28. The method of claim 27, wherein the step of  
2   rotating comprises rotating in a preselected one of a  
3   clockwise and a counterclockwise direction.

1           29. The method of claim 27, further comprising the  
2   step of preventing other computers from moving into the  
3   closer neighboring logical position and from moving into  
4   the same level neighboring logical position during said  
5   steps of moving and rotating.

1           30. The method of claim 25, wherein each of the  
2   plurality of concentric polygons has the same number of  
3   sides and has an even number of sides.

1           31. A method for logically configuring a collection  
2 of computers, comprising:

3                 selecting a computer to serve as a logical  
4 center of the collection of computers;

5                 arranging computers from the collection of  
6 computers such that the collection of computers are  
7 logically configured to form a plurality of successively  
8 higher concentric polygon levels around the logical  
9 center;

10                adding a computer to the collection of  
11 computers;

12                logically connecting the added computer to a  
13 computer in the collection of computers, located at a  
14 collection edge, wherein the collection edge comprises a  
15 logical outer edge of the collection of computers and  
16 forms at least a partial concentric polygon level around  
17 the plurality of concentric polygon levels; and

18                repeating the steps of:

19                         changing a logical location of the added  
20 computer to a next lower concentric polygon level if  
21 a computer in the collection of computers is not  
22 situated at a logical position that neighbors the

23           added computer at the next lower concentric polygon  
24           level; and  
25                    changing a logical location of the added  
26           computer to a logically adjacent position on a  
27           current concentric polygon level of the added  
28           computer if a computer in the collection of computers  
29           is not situated at said logically adjacent position.

1           32. The method of claim 31, further comprising the  
2           step of sending a message from a top computer of the  
3           collection of computers to each of a plurality of  
4           neighboring radial computers, each neighboring radial  
5           computer forwarding the message to another neighboring  
6           radial computer and to a neighboring indirect radial  
7           computer, such that the message is forwarded to each  
8           computer in the collection of computers only once.

1           33. The method of claim 31, wherein the collection  
2           of computers comprises one of a collection of caching  
3           computers and a collection of non-caching computers,  
4           wherein each caching computer stores information relating  
5           to a corresponding collection of caching computers.

1           34. A computer network, comprising:  
2               a collection of caching computers logically  
3 arranged such that a first caching computer is situated at  
4 a logical center of the collection of caching computers,  
5 wherein the remaining caching computers are logically  
6 arranged to form at least one concentric polygon around  
7 the first caching computer;  
8               at least one collection of non-caching  
9 computers, each respective collection of non-caching  
10 computers logically arranged to form a plurality of  
11 successively higher concentric polygon levels around a  
12 respective caching computer that stores information  
13 relating to the respective collection of non-caching  
14 computers;  
15               at least one communication medium providing a  
16 physical interconnection between the caching computers in  
17 the collection of caching computers and the non-caching  
18 computers in the at least one collection of non-caching  
19 computers, said physical interconnection unrelated to said  
20 logical arrangements; and  
21               at least one of the collection of caching  
22 computers and the at least one collection of non-caching  
23 computers logically arranged such that a message

24 originating at a top computer is forwarded along each of  
25 at least one radial, each said radial comprising a line of  
26 logically adjacent computers that logically extends  
27 radially from the top computer, and wherein a plurality of  
28 computers forming the radial further forward the message  
29 along an indirect radial, each said indirect radial  
30 comprising a line of logically adjacent computers that  
31 logically extends radially from a corresponding one of the  
32 plurality of computers and that does not intersect any of  
33 the at least one radial.

1 35. The computer network of claim 34, wherein each  
2 caching computer operates to determine whether its  
3 available bandwidth is greater than an available bandwidth  
4 of a logically adjacent caching computer logically closer  
5 to the first caching computer and to switch positions with  
6 the logically adjacent caching computer when the available  
7 bandwidth of the caching computer is greater than the  
8 available bandwidth of the logically adjacent caching  
9 computer.



1           36. The computer network of claim 35, further  
2     comprising at least one added non-caching computer,  
3     wherein the added non-caching computer logically attaches  
4     to a collection of non-caching computers associated with a  
5     caching computer currently situated at the logical center  
6     of the collection of caching computers.

1           37. The computer network of claim 34, wherein the  
2     information relating to the respective collection of non-  
3     caching computers comprises an index of data stored on the  
4     respective collection of non-caching computers.

1           38. The computer network of claim 34, further  
2     comprising at least one added computer, wherein the at  
3     least one added computer is assigned as one of a caching  
4     computer and a non-caching computer based on an available  
5     bandwidth of the at least one added computer.

1           39. The computer network of claim 34, wherein the  
2     message comprises one of broadcast information and search  
3     request data.

1           40. A distributed computer network, comprising:  
2                 a collection of computers;  
3                 means for an added computer to locate the  
4 collection of computers;  
5                 means for the added computer to establish a  
6 connection to the collection of computers;  
7                 means for each computer in the collection of  
8 computers, including the added computer, to establish a  
9 logical arrangement such that each computer in the  
10 collection of computers can act as a top level of a  
11 hierarchy, wherein the hierarchy includes at least a  
12 substantial number of the computers in the collection of  
13 computers.

1           41. The distributed computer network of claim 40,  
2 wherein the hierarchy comprises a set of member computers,  
3 a membership of which depends upon a logical location of  
4 the computer that acts as the top level of the hierarchy.

1           42. The distributed computer network of claim 40,  
2 further comprising means for the computer that acts as the  
3 top level of the hierarchy to initiate a search for one of  
4 a specified computer and specified data.

1           43. The distributed computer network of claim 42,  
2 wherein each computer in the collection of computers  
3 includes a searchable index of the contents of the  
4 computer for facilitating said search.

1           44. The distributed computer network of claim 40,  
2 further comprising means for the computer than acts as the  
3 top level of the hierarchy to broadcast information  
4 throughout the hierarchy.

1           45. The distributed computer network of claim 40,  
2 further comprising means to control a bandwidth  
3 utilization of the collection of computers.

1           46. The distributed computer network of claim 40,  
2 further comprising a plurality of lower level computers,  
3 wherein information regarding the lower level computers is  
4 stored in a respective one of the computers in the  
5 collection of computers.

1           47. The distributed computer network of claim 40,  
2 further comprising means for rebuilding a logical  
3 arrangement of the collection of computers following a  
4 loss of at least one computer from the collection of  
5 computers.

1           48. The distributed computer network of claim 40,  
2 further comprising means for distributing software updates  
3 throughout the collection of computers.

1           49. The distributed computer network of claim 40,  
2 wherein each computer in the collection of computers  
3 includes a dynamic physical address.

1           50. The distributed computer network of claim 40,  
2 further comprising means for generating the logical  
3 arrangement to substantially minimize a logical distance  
4 between a logical center of the collection of computers  
5 and a logical collection edge.